standardization of smart textiles and wearable intelligence

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Terminology

- Smart textiles/ intelligent textiles
- Wearable intelligence/ smart wearable devices

Overlap:
Wearable smart textiles = subgroup of Smart wearable devices
Technology

Flexible/stretchable vs. ridged electronics

- Mechanical properties
  - Can be utilised as electro-mechanical transducer
- Environment (wearables)
  - Closeness to human skin: Temperature, humidity, etc.
- Maintenance
  - Washing, cleaning, etc.
standardization activities

- Smart textiles and textile products
  - CEN/TC 248 Textiles and textile products, WG 31 Smart Textiles - established 2008
  - Under evaluation: Product specific (respective product TC)
  - ASTM Subcommittee Smart Textiles (D13.50) - 2016
  - AATCC R111 Electronically Integrated Textiles - 2016
  - IEC/ TC Wearable Smart Devices - to start in 2017
standardization activities

- **Wearable Intelligence**
  - IEC SR 10 Wearable Smart Devices, 2015-2016 to prepare proposal for new IEC/TC
  - IEC System Committee Active Assisted Living (SYC AAL), established December 2015
Textiles and textile products — Smart textiles — Definitions, categorisation, applications and standardization needs

- definitions in the field of smart textiles and textile products
- categorisation of different types of smart textiles
- current stage of development of these products and their application potential
- indications on preferential standardization needs
1. Smart (intelligent) textile material
functional textile material, which interacts actively with its environment, i.e. it responds or adapts to changes in the environment

2. Smart (intelligent) textile system
textile system which exhibits an intended and exploitable response as a reaction either to changes in its surroundings/environment or to an external signal/input
Categorisation

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standardization approach

First follow-up projects (based on products on the market):

- Textiles and textile products containing Phase change materials
- Textiles and textile products with integrated electronics (electronic textiles)
Phase change materials

Textiles and textile products - Textiles containing phase change materials (PCM)

- Part 1 = EN 16806-1:2016 : Determination of the heat storage and release capacity (Published)
  ➞ Testing of material (DSC)

- Part 2: Determination of the heat transfer using a dynamic method - At preliminary stage
  ➞ Testing of fabric/ partial product: dynamic hotplate

- Part 3: Determination of the heat transfer between the user and the product - Waiting for part 2 to be brought to a more advanced stage
  ➞ Testing of final product: dynamic manikin?
Electronic textiles/ Textile electronics

Basic element: conductive textile tracks ≠ electrical wire

- EN 16812:2016 Textiles and textile products - Electrically conductive textiles – Determination of the linear electrical resistance of conductive tracks (Published)
- Application: conductive yarns, ribbons, etc.
Next phase projects

Two projects at preliminary stage:

1. Revision of CEN/TR 16298:
   ⇒ update to match current state of the art

2. CEN/TR dedicated to electronic textiles
   ⇒ specific guidance document
CEN/TR electronic textiles

Textiles and textile products — Textiles with integrated electronics and ICT — Definitions, categorisation, applications and standardization needs

• Guidance
• Positioning of electronic textiles between textiles and electronics
• Identifying existing standards and where modifications/new standards are needed
TR electronic textiles – first definitions

Integration level

- Extent to which an electronic component or device is integrated onto or into a textile material or textile product
- an e-textile can contain several electronic devices and or components which may have different levels of integration or may or may not be interconnected

4 integration levels defined
Integration levels 1 & 2

integration level 1 (removable)
- electronic device is added in a way that it is removable without destroying the product, e.g. via a pocket, touch-and-close fastener, push button, etc.

integration level 2 (attached)
- electronic device is attached to textile in a way that it is not removable without destroying the product, e.g. stitched, welded, glued, etc. to the textile
Integration levels 3 & 4

Integration level 3 (mixed solution)
- electronic device consists of one or more components are made of textile or textile finishing and combined with permanently or non-permanently attached electronic components, e.g. an LED lamp attached to a conductive track woven into a fabric.

Integration level 4 (full textile solution)
- all components of the electronic device are made of textile or textile finishing.
Categorisation – important issues

- Function and intended use
- Legislation
- Risks/ Hazards
- Markets
- Existing standardization framework (technical committees)
- ...

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Examples

- Based on actual product under development or in the market
- For the moment no specific focus on PPE
  ⇒ Possible to add an example
  ⇒ Link to standardization Request possible
Link to certification – Intended use

Intended use:

- Medical device
- Protective clothing
- General product safety
- Data privacy
- Textile labelling
- .....

⇒ more than one directive/regulation may apply
Current approach:

- Testing/ certification necessary for the intended use, considering the product as
  - textile product
  - electronic device
- Risk/ hazard assessment to identify additional testing specific to the electronic textile product
CEN/TC 248 WG 31 - Meetings

- 2-3 times per year (usually Brussels)
- Last meetings
  - Phase Change Materials 2016-07-08
  - Electronic Textiles 2016-07-07
- Next meetings
  - Phase Change Materials 2016-11-22 (Brussels, CEN)
  - Electronic Textiles 2016-11-23 (Brussels, CEN)

Some countries have a National Mirror Committee
IEC SR 10

Wearable Smart Devices (WSD)
Final report to SMB

- Terminology and agreed understanding
- Market survey: ongoing and prognosed developments, needs
- Inventory of activities within and outside IEC
- Recommendations on WSD related standardization activities: proposal to establish a new TC
- Roadmap of WSD related standardization (priority)

⇒ Strong relation to work on electronic textiles
ASTM

Subcommittee on Smart Textiles (D13.50)
Approach

Terms & Degrees of Intelligence

Applications
- Smart Military Clothing
- Healthcare Applications

Consensus test methods for performance:
- home laundering and washability
- electrical safety and electromagnetic compatibility (e.g. interference with a wearer’s pacemaker)
- corrosion of embedded electronics caused by dyes, finishes, perfume, and sweat, among others
Cooperation & Expertise

- ASTM D13 (textile)

Drawing expertise from e.g.
- F23 Personal Protective Clothing and Equipment
- E56 Nanotechnology
- F42 Additive Manufacturing Technologies
- F04 Medical and Surgical Materials and Devices
- F15 Consumer Products

Short overview: http://www.astm.org/standardization-news/?q=features/how-smart-your-shirt-so16.html
AATCC RA111

Electronically Integrated Textiles
Approach

- Develop methods and terminology for testing electronically integrated textiles
- Current project:
  - assessment of e-textile laundrability
PRODUCT SPECIFIC ACTIVITIES
Personal Protective Clothing

BSI PAS 10412 Intelligent clothing – LED active high visibility clothing – Specification

- Focus on the additional electronics
- To be used in conjunction with EN ISO 20471
- Available in the BSI webshop
Personal Protective Clothing

New horizontal CEN/TC on personal protective systems and ensembles (revised proposal under development)

⇒ WG on integrated electronics & ICT

- Safety and reliability - Product & whole system
- Care and maintenance
- ...

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Childrens clothing & accessories

Product safety

- Design
- Realisation
- Components
- ....

⇒ Guidelines for design, safety/risk assessment and certification
Contact

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